ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

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XII.—CATASETUM DARWINIANUM.

R. A. Rolfe.

The accompanying plate represents a plant of *Catasetum Darwinianum*, Rolfe, bearing male and female flowers on the same inflorescence. The plant flowered last autumn in the Kew collection, with a second plant which bore only male flowers. Both specimens are divisions of a single plant which in 1888 produced both sexes on separate inflorescences, one of about 16 male flowers on one side of the pseudobulb and one of three females on the other side. In the present case the three upper flowers are males, the next female, and the lower one is in a transition state, the lip being most like the female in shape, but the sepals and petals most like the males, while the pollinia are almost normally developed. It may be added that in the female flower the anther case and the pollinia—both of male origin—were suppressed, while the stipes and gland of the pollinarium—which belong to the rostellum, and are therefore female in origin—were developed. The lip of the female, it will be observed, is hood-shaped and uppermost, while the sepals and petals are recurved and rather fleshy in substance, and the column very short and stout, with a slender apiculus. In the males the lip is inferior and consists of an ovate-oblong body, slightly convex and tridentate at the apex, and concave or with a shallow sac at the base. The sepals are lanceolate and spreading, and the somewhat narrower petals are parallel and situated in front of and appressed to the upper sepal, and therefore hardly distinguishable in the photograph. The column is longer than in the female, much more slender, and bears a pair of slender somewhat diverging sensitive antennae, which are totally absent from the female. Another remarkable difference between the sexes is that the female flowers are green, with a few dingy purple markings, while the males have lurid reddish-purple sepals and petals, and the lip is heavily spotted with blackish-brown on a dull green ground.

The phenomena here illustrated were long a profound puzzle to botanists, and plants bearing female flowers only were originally referred to a distinct genus by Lindley, under the name of *Monachanthus*, while the males of certain species, structurally identical

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with the one here figured, were referred by him to *Myanthus*, on account of the difference in their structure from the original *Catasetum macrocarpum*, Rich. Lindley afterwards pointed out his mistake, when an inflorescence combining two of his supposed genera was sent to him by the Duke of Devonshire (Bot. Reg., t. 1947 A, text 1951*), but without understanding the significance of the phenomenon, and, while remarking that the supposed genera *Myanthus* and *Monachanthus* must be restored to *Catasetum*, he added : " But which of the species have their masks on, and which show their real faces, I certainly will not presume to guess."

The question was the subject of a noteworthy paper by Darwin, published in 1862 (Journ. Linn. Soc., vi. pp. 151–157), entitled " On the Three remarkable Sexual Forms of *Catasetum tridentatum*, an Orchid in the possession of the Linnean Society." In this paper Darwin sought to show that *Catasetum tridentatum*, Hook., produced three different kinds of flowers, which represented male, female and hermaphrodite states of the same species. A wood-cut of each was given.

Darwin established the fact that the sportive character of *Catasetum*, or the curious habit of its species of suddenly producing flowers of a totally different kind (usually termed " monsters ") on the same plant was simply an abnormal combination of different sexual forms in the same individual, but he failed to discover that the name *Monachanthus viridis*, Lindl., had been extended so as to include more than one species of *Catasetum*. In fact he misread some remarks of Schomburgk, who had already stated that *Monachanthus* alone bore seeds, and had expressed the opinion that " the genera *Monachanthus*, *Myanthus* and *Catasetum* form but one genus " (Trans. Linn. Soc., xvii. p. 551). The consequence of this was that Darwin, whilst showing satisfactorily that *Catasetum* was male and *Monachanthus* female, thought that *Myanthus barbatus*, Lindl., of which he had only a spirit specimen, might be considered as the hermaphrodite form of the same species. This view passed as current for many years, until, after a re-examination of all the records, aided by some fresh materials, the writer was enabled to clear the matter up in a paper entitled " On the Sexual Forms of *Catasetum*, with special reference to the researches of Darwin and others " (Journ. Linn. Soc., xxvii. pp. 206–225, t. 8).

In this paper it was shown that the females of three different species of *Catasetum* passed under the name *Monachanthus viridis*, Lindl., the original one, apparently the female of *C. cernuum*, Reichb. f. (*Myanthus cernuus*, Lindl.), one figured in the Botanical Register (t. 1752), of which *C. macrocarpum*, Rich. (*C. tridentatum*, Hook.) is the male, and *M. viridis*, Schomb., the male of *C. barbatum*, Lindl. (*Myanthus barbatus*, Lindl.). Thus *Catasetum tridentatum* and *Myanthus barbatus* were both males, very distinct from each other, though a general resemblance of the females to each other had led to all being confused under a single species.

An examination of all the materials available led to the establishment of four distinct sections of the genus, as follows :—

i. **Eucatasetum**, *Rolfe*.—Lip superior in both sexes, generally more or less galeate in the male, always so (as far as known) in the

female. Rostellum in the male prolonged below into a pair of slender cirrhi, called the antennae.

ii. **Myanthus,** *Rolfe* (genus of Lindl.).—Lip inferior in the male, not galeate, more or less expanded, sometimes fringed; superior and galeate in the female. Rostellum in the male prolonged below into a pair of slender cirrhi.

iii. **Ecirrhosae,** *Rolfe.*—Lip inferior in the male, as in *Myanthus*, but more or less saccate. Rostellum not prolonged into cirrhi. Female unknown.

iv. **Pseudocatasetum,** *Rolfe.*—Lip deeply saccate in the male, superior or inferior. Rostellum not prolonged into cirrhi. Female, where known, much larger than the male, with galeate lip.

The mechanism of propulsion of the pollinia by means of the sensitive antennae was fully explained by Darwin, and the method of fertilisation in *C. tridentatum* was afterwards described and illustrated by Crüger (Journ. Linn. Soc. viii. p. 127, t. 9), who was able to observe the species in Trinidad, where it is common. The visiting insect is described as a "large humble-bee, noisy and quarrelsome," which visits the flowers of both sexes for the purpose of gnawing some cellular tissue in the interior of the sac. On visiting the male flowers the pollen masses are thrown on to the back of the insect, and Crüger had often seen them flying about with this peculiar-looking ornament on them. On subsequently visiting the female flower the pollinia were caught by the upper margin of the stigmatic cavity, and were left behind on the retreat of the insect. The function of the sensitive antennae in the sections *Eucatasetum* and *Myanthus* is thus apparent, but these organs are not developed in the more primitive *Ecirrhosae* and *Pseudocatasetum*, so that some other mechanism must be available, which it would be interesting to work out.

Catasetum Darwinianum was described in 1889 (Rolfe in Gard. Chron., 1889, v. p. 394), the plant having flowered at Kew in the previous autumn, and was at first identified with *C. fuliginosum*, Lindl. (Rolfe, l.c. 1887, iv. p. 473), a species which was described by Lindley from a plant of unrecorded origin which produced female flowers only at Syon House, in 1841, and was subsequently lost. The Kew plant was obtained from Messrs. Sander, St. Albans, to whom it had been sent with other Orchids by one of their collectors from Mt. Roraima. It belongs to the section *Myanthus*, and is allied to *C. callosum*, Lindl., but has smaller flowers of darker colour. A painting, natural size, of the plant was made for the Kew collection, and a reduced figure was given in the paper above mentioned (Rolfe in Journ. Linn. Soc., xxvii. p. 218, t. 8), with flowers of both sexes, natural size, and dissections. The species was named in compliment to the great naturalist, but was not one of those investigated by him.

It may be added that the females of some 20 species are now known, representing perhaps a third of the genus, so that there is plenty of scope for those who may be able to observe the plants in their native wilds or who cultivate them at home. It is greatly to be desired that this blank in our knowledge should be filled up.

The female flowers are for some reason much rarer than the males, but are generally borne upon the same plants, and occasionally on the same inflorescence, as in the present case.

XIII.—A NEW BANANA FROM THE TRANSVAAL.

(*Musa Davyae*, Stapf.)

O. Stapf.

On the cover of the April number of the Transvaal Agricultural Journal for the year 1904 a banana of especially fine growth was figured, standing in a garden. No reference was made, on the cover or in the text, to the place where it grew or the species to which it belonged; but from a later communication by Mr. J. Burtt Davy, the Government Agrostologist and Botanist for the Transvaal, it was understood that the figure represented a Musa from the Drakensbergen, Zoutpansberg District, Transvaal, grown in a garden at Pretoria. The same species was referred to by him in the Transvaal Agricultural Journal for 1907 (vol. v. p. 422) as "*Musa Livingstoniana*, Kirk? Wild Banana; Wild Piesang; Matella." It was there said to grow along streams on the eastern slope of the Drakensbergen from 4800 ft. down to about 2800 ft. Subsequently in 1911 in an article on "Banana and Plantain fibre" (Agr. Journ. Union S. Afr. vol. I. p. 93) it was, by the same author, referred to *Musa ventricosa*. In the same year Mr. W. C. Worsdell communicated to Kew seeds of this plantain which he had gathered near the fruit-farm "Westphalia," about 60 miles north of Pietersburg, Zoutpansberg District, in 1911. From the seeds it was evident that the plant belonged neither to *M. Livingstoniana* nor to *M. ventricosa*; but in the absence of specimens no determination was possible. Last year, however, Mr. Burtt Davy sent drawings of the inflorescence, flowers and fruits made from the plant in 1906 by Mrs. Burtt Davy, and these rendered it possible to connect the Transvaal plant with good flowering specimens which were collected in 1907 by Mr. W. H. Johnson in Amatonga's Forest in Portuguese East Africa just over the Transvaal frontier, and almost in the same latitude as the Zoutpansberg District.

It is evident that this Musa comes near to *M. Ensete* and may be still more closely allied to *M. Buchananii* from the Shire Highlands; but the latter is so imperfectly known that adequate comparison is not possible. A technical description of the species together with a differential diagnosis relative to *M. Ensete* is given below.

M. Davyae inhabits as far as is known at present an area lying between 30° 25′ to 32° 30′ E. long. and 23° to 24° S. lat. According to Mr. Burtt Davy it occurs forming groves "in sheltered Kloofs at about 1400 m. altitude, on the eastern slopes of the Houtboschberg, a spur of the Drakenberg Range in the Zoutpansberg Magisterial District." He found plants growing actually in the water of

mountain streams about 10 miles from the village of Harnertsberg, "and it was also reported to him as abundant along the rivers of the Low Veld below Krabbesfontain (800 m)." Mr. Worsdell's collecting place near "Westphalia Farm" has already been mentioned. There is also a leaf of a Musa at Kew which belongs almost certainly to *M. Davyae* and was collected by Mr. H. Mingard in the Spelenken mountains near Elim in 1905. A further locality is indicated by the name of a hill 'Pisang Kop' (400 m.), in the Zoutpansberg range, north of Albasini in 30° 30′ E. Long. and 23° 35′ S. Lat. This name appears already in the Transvaal map published in Petermann's Mittheilungen, Erg. B. v. no 24 (1868), where the hill is, however, placed 17 miles due east of Albasini. As the Boers came first into the district in 1844, the occurrence of the banana or pisang in those mountains must have been known for a long time. All these localities are in the Transvaal. On the other hand, Mr. Johnson's specimen comes from Portuguese territory and an altitude of not quite 400 m. He describes the locality as "Amatonga's forest." This is evidently the forest near Amatonga's kraal to the east of the Limpopo river and in the latitude of Elim. The native name quoted by Mr. Burtt Davy in the Transvaal Agricultural Journal is "Matella," or as spelt in his latest communication "Mawdawla" (Modjadjie natives).

Musa Davyae is said to yield a fibre used by the natives, but as the fruit is not edible it would, in Mr. Burtt Davy's opinion, not pay to cultivate the species unless the fibre should prove to be particularly valuable.

Musa Davyae, *Stapf*, affinis *M. Ensete*, J. F. Gmel., vel potius *M. Buchananii*, Bak., speciei imperfecte notae, sed ab illa bracteis flores subtendentibus magis oblongis, floribus tantum circiter 15 cum unaquaque bractea minoribus, labio interiore (supero) profundius lobato, ab hac bracteis latioribus, labio exteriore angustiore et seminibus haud atris differt.

Planta monocarpica. *Truncus* spurius 10–13 m. altus. *Foliorum* laminae erectae vel oblique erectae, rigidae nisi superne leviter recurvatae, oblongo-lineares vel anguste-oblongae, obtusae, 4–5 m. longae, ad 60 cm. latae, subglaucae, costa supra canaliculata rubra, nervis lateralibus primariis 5–7 mm. vel in foliis majoribus 1 cm. distantibus. *Inflorescentia* integra haud visa; pedunculus aeneus, glauco-pruinosus, basi ad 5 cm. crassus; bracteae flores subtendentes oblongae vel ovato-oblongae, obtusae, 27–30 cm. longae, 11–12·5 cm. latae. *Flores* circiter 15 cum unaquaque bractea, albido-lutescentes. *Receptaculum* cylindricum vel anguste clavatum, 2 cm. longum, glauco-pruinosum. *Tepala* externa 3 cm. longa cum duobus internis lateralibus approximatis labium inferum formantia, e basi per 4 mm. connata, deinde per 6–7 mm. soluta, supra iterum fusa ita ut lamina linearis 2–2·5 mm. lata apice 3-dentata crassiuscula constituatur cui tepala interna tenuia 0·4 mm. lata crispo-undulata arcte adhaerent, dentibus 3–4 mm. longis; tepalum internum superum lobo intermedio e basi latiore subulato 3–5 mm. longo, lobis lateralibus rotundatis vel ovatis et tunc interdum subacutis 2–3 mm. longis, totum 1·2 cm. longum. *Stamina* perfecta 5; filamenta ad 1·6 cm. longa; antherae 1·7–2 cm.

longa; stamen sixtum (superum) staminoideum filiforme vel nullum. *Stylus* cum stigmate oblique ovato 2·5 cm. longus. *Infructescentia* integra ignota. *Baccae* clavatae, 7·5–12 cm. longae, ad 4 cm. diametro, maturae flavidae. *Semina* pauca, in pulpa parca flavida insipida immersa, depressa, irregulariter orbicularia, vel obtuse triangularia, 1·6–1·8 cm. diametro, hilo excavato subtriangulari magno; testa laevis, plumbeo-brunnea.

XIV.—FUNGI EXOTICI: XVI.

Three of the new Fungi described have developed on a small piece of cattle dung sent from Singapore by Mr. I. H. Burkill enclosed in a letter. *Pilobolus crystallinus* appeared soon after the dung was placed under suitable conditions and in the course of time the three other fungi, new to science also developed. The three other species have been received from Kuala Lumpur, Queensland and the West Indies.

Basidiomycetes.

Merulius binominatus, *Massee.*

Hymenophorum late incrustans, vegetum contiguum; hymenium subgelatinoso-molle, superficie plicis sinuosis obtusis reticulatum, hinc inde incomplete porosum, sordide aurantiacum, in sicco fulvescens. *Sporae* subglobosae, flavidae, 4 × 3·5 μ.

Queensland. Brisbane: Botanic Gardens; on bark of a *Callistus*, *F. M. Bailey*. Superficially resembles some forms of *Merulius lacrymans*, Fries, but readily distinguished by the very much smaller spores.

Ascomycetes.

Apiosporium atrum, *Massee.*

Mycelium plagulas atras suborbiculares saepe confluenti-irregulares velutinas matrici arcte adnatas efficiens. *Perithecia* centro plagularum densissime aggregata, viva globosa, sicca cupulato-collapsa, basi setulis cincta, contextu indistincto atro, 200–300 μ. diametro. *Asci* ovati, deorsum in pedicello longissime producti, polyspori. *Sporae* cylindraceae, hyalinae, continuae, 9–12 × 2–2·5 μ; adest status stylosporicus.

Federated Malay States. Kuala Lumpur: the dead branches of Para rubber trees, *C. K. Bancroft*.

Not considered as a parasite, but common on dead branches. Allied to *Apiospora australe*, Speg.

Physalospora immersa, *Massee.*

Perithecia sparsa, immersa, hyalina, circa 300 μ diametro, ostiolo vix exserto donata, globosa, glabra, subcarbonaceo-membranacea, contextu parenchymatico subindistincto. *Asci* fusoidei, sursum acuminati, deorsum modice attenuato-stipitati, octospori. *Sporae* plus vel minus distichae, ellipsoideae, continuae, hyalinae, 6 × 4 μ.

Straits Settlements. Singapore: Botanic Gardens; on cattle dung, *I. H. Burkill.*

Allied to *P. disseminata*, Sacc., but distinguished by the shorter spores and clavate asci.

Ceratostomella coprogena, *Massee.*

Perithecia minuta, e conoideo subglobosa, atra, glabra, membranacea, 200 μ diametro, ostiolo elongato-acutato, contextu parenchymatico. *Asci* cylindraceo-clavati, apice obtuse truncati, octospori. *Sporae* ellipticae, hyalinae, 7 × 4·5 μ.

Straits Settlements. Singapore: Botanic Gardens; on cattle dung, *I. H. Burkill.*

Allied to *C. leiocarpa*, Sacc., differing in the smaller spores, and from all known species in its habitat.

Sordaria Burkillii, *Massee.*

Perithecia laxiuscule gregaria, semi-immersa, atro-olivacea, majuscula, 350 × 250 μ, ostiolo cylindraceo crassiusculo incurvo vertice rotundato-truncato atro piloso ornata. *Asci* cylindraceo-clavati, sursum obtusissime rotundati, deorsum in pedicellum attenuati, octospori. *Sporae* oblique monostichae, ellipticae, violaceo-brunneae, 28–33 × 18–20 μ, deorsum cauda cylindraceo-acutata hyalina facile decidua auctae.

Straits Settlements. Singapore: Botanic Gardens; on cattle dung, *I. H. Burkill.*

Most nearly allied to *Sordaria communis*, Sacc.

Deuteromycetes.

Gloeosporium cocophilum, *Wakefield.*

Acervuli erumpentes, sparsi vel aggregati, caulicoli, usque ad 0·5 μ diametro. *Conidia* cylindracea, hyalina, 13–21 × 5 μ, in massulis roseis irregularibus emergentia. *Conidiophores* fuscae, 15–20 × 2–3 μ.

West Indies. St. Vincent: On petioles of *Cocos nucifera*, *F. W. South*, 135, 136, 137.

In the recently published descriptions of Exotic Fungi, *K.B.*, 1912, p. 358, the locality for *Isaria Pattersonii*, Massee, was erroneously given as the Gold Coast, the material having been received from that Colony without definite information.

We learn from Mr. Patterson that this fungus was collected in the island of St. Vincent, West Indies, on the pentatomid *Nezera viridula*. Specimens of the fungus have recently been received at Kew from the island of Grenada through the Imperial Department of Agriculture for the West Indies.

XV.—NOTES ON TREES AND SHRUBS, IRELAND.

W. J. Bean.

The following notes were taken during a fortnight's visit to Ireland in February last. Several places visited are not dealt with in detail because an account of them has already appeared in the *Bulletin* (1906, p. 219–224) such as of Glasnevin, Castlewellan, Mr. T. Smith's nursery at Newry, and Mount Ussher.

Powerscourt, which I visited on February 12, provides a wonderful feast for the tree-lover in the numerous and beautiful specimens of *Abies Nordmanniana*, the Araucarias, a splendid *Abies grandis*, one of the finest *Nothofagus betuloides* in these islands, a golden weeping Nootka Sound cypress, and very attractive examples of *Cupressus torulosa*, *Picea polita*, *P. hondoensis* and *Fitzroya patagonica*.

At **Old Conna Hill**, a few miles from Powerscourt, is the seat of Capt. L. Riall, where some of the most admirable gardening in Ireland is done. The chief feature of the place is the pinetum not far from the house, where some very fine specimens may be seen. Thus of silver firs, *Abies Lowiana* is 60 ft. high, *A. Pinsapo* 55 ft., *A. religiosa* 70 ft. *Torreya californica* is 28 ft. high and *Pinus monophylla* 18 ft., probably the largest in the British Isles. *Castanopsis chrysophylla*, the Golden Chestnut of California, has a clean smooth trunk 1 foot in thickness. In an enclosed, old-world garden is a splendid *Cordyline australis* with a much branched head, and a trunk 6 ft. in girth, and bushes of *Erica arborea* 10 ft. high, shapely and dense. *Dendromecon rigidum*, the Californian, tree-poppy, is 12 ft. high against a wall, its main stem 6 ins. in thickness; Capt. Riall says it is always in flower. *Acacia dealbata* has been out 10 years and is now a charming tree 30 ft. high, thickly branched, its trunk 15 in. in diameter; on February 12, it was just opening the first of a great crop of flowers. *Genista fragrans*, too, 15 ft. high, growing against a wall was full of blossom.

A visit was paid to **Hamwood**, the home of Mr. Chas. R. Hamilton, near Dunboyne, where there is a very excellent selection of conifers and flowering trees and shrubs. I was attracted to Hamwood by hearing of the fine *Griselinia littoralis* there. Mr. Hamilton has both the male and female plants and the latter bears fruit freely. They are like small ivy berries and the seed they contain is quite fertile, young plants springing up all over the garden. This place appears to have been the first, perhaps as yet the only one, where *Griselinia littoralis* has borne fruit in this country. Among the conifers is a very fine *Pinus monticola* 70 to 80 ft. high which must be about the tallest in Ireland, and *P. aristata* is 20 ft. high. Other interesting plants of unusual size are *Fagus sylvatica* var. *cristata* 45 ft. high; *Retinispora ericoides* (a juvenile form of *Thuya orientalis*) 8 ft. high and 15 ft. through; *Berberis Darwinii* 18 ft. high. A beautiful spring effect is produced by

Anemone apennina which, introduced a good many years ago, has now spread itself amongst the trees and shrubs all over the grounds.

Rostrevor.

On the side of a hill sloping in the direction of Carlingford Lough is most beautifully situated the garden of Sir John Ross of Bladensburg. The garden is sheltered on the north by the Mourne Mountains, and on the southern side of the Lough are other picturesque mountains full in view. As may be judged from the presence of many of the plants mentioned below, the garden occupies a site that encourages the growth of tender plants in a way rarely experienced so far to the north. The hill on which it stands slopes abruptly to the south and is itself considerably elevated above the level of the sea. These various factors—the surrounding mountains, the nearness of the sea, the elevation of the garden itself above its immediate surroundings, and its full exposure to the south—are all in favour of the well-being of tender plants. It is fortunate for Irish horticulture that this spot is in the hands of so enthusiastic a collector and cultivator.

The publication of a list by Sir John two or three years ago of the plants cultivated at Rostrevor prepared one for seeing a large number of species of shrubs and trees there. It is one thing, however, possessing representatives of a great number of species and quite another growing them so well that they are a pleasure to look upon. It was a very gratifying experience to find such great numbers of rare plants so carefully tended and studied and to see them in such promising health and vigour. Sir John is a botanist and a student, but he is a gardener as well. Much of the hillside which he has given up to exotic vegetation was originally covered with gaunt spreading old laurels. It is amongst these he has planted his treasures, wisely using the laurels as windbreaks and for shelter generally, only reducing or removing them as the other things grow, secure a firm foothold, and need more space.

The shrubs most in prominence here are not those we see in the ordinary garden, but rather what we associate with the greenhouse. They do not represent the floras of Northern Europe, N. America and parts of N. Asia so much as those of Chile, Mexico, Australasia, S. Europe, S. Africa and the Himalaya. In a little walled in space there were, on the walls, *Genista elegans* 10 ft. high, *Cytisus proliferus* 12 ft. high, *Buddleia auriculata* 16 ft. high, and *Billardiera longiflora* bearing the remnants of a large crop of its brilliant blue fruits.

Conifers.—Among conifers growing in the open were such interesting and tender things as *Tsuga Brunoniana*; the three *Athrotaxis*—*A. cupressoides* (12 ft. high), *A. laxifolia* and the coarser-leaved *A. selaginoides*; *Dacrydium Franklinii*, *Callitris oblonga* bearing many cones, *C. robusta*, and their curious ally from N. Africa, *Tetraclinis articulata*. The New Zealand "Totara," *Podocarpus Totara*, although only about 5 ft. high, was thriving

well, as was also the curious and very distinct *P. Nageia* from Japan. *Juniperus Cedrus* was succeeding well; this juniper, now nearly extinct on its native mountains in the Canary Islands, has latterly been brought into prominence by Dr. Perez of Orotava, Teneriffe, who in recent years has interested himself much in its preservation and distribution. The fine Chinese *Libocedrus macrolepis*, whose tenderness in such places as Kew has been a great disappointment, appeared quite at home, as did also its New Zealand ally, *L. Doniana*. *Abies religiosa*, the rare Mexican silver fir, increases in height here at the rate of 2 ft. annually. Finally, may be mentioned *Keteleeria Fortunei*, of which so magnificent an example grows in the nursery of Messrs. Rovelli at Pallanza (see *Kew Bulletin* 1912, p. 288); here at Rostrevor is one of the few plants I have seen thriving out of doors in the British Isles.

Australian Shrubs.—An interesting feature of the collections is the number of Australian shrubs they contain. We are accustomed to the presence of New Zealand plants in our gardens but Australian ones are rare. At Kew, only one shrub from that country is really hardy in the open—*Podocarpus alpina*. As examples showing the richness and interesting nature of the open air collections at Rostrevor may be mentioned: *Hibbertia Readii*, *Sollya heterophylla* (self-sowing), *Leucopogon Richei*, *Hakea ulicina*, *H. pugioniformis*, *Acacia verticillata*, *A. pycnantha* (25 ft. high), *Pomaderris apetala*, *Lomatia longifolia* (4 ft.), *Olearia Gunniana* (7 ft. in height and diameter), *Muehlenbeckia varians*, whose thin wiry stems form a tangled mass 15 ft. in diameter, and about as high. Various species of *Leptospermum* of course abound; they even spring up as self-sown seedlings about the grounds, but a plant 6 ft. high of *L. Nicholi*—the shrub which gained the award for the best new plant at the International Show last May—was a pleasant surprise. There is a great collection of Olearias, Pittosporums, Senecios, and Coprosmas, many of which belong to New Zealand.

The number of plants grown is so large that space will not allow of mention of more than a small proportion of them, but of especial interest were *Anopteris glandulosa* from Tasmania, a beautiful evergreen with racemes of bell-shaped flowers; *Libonia floribunda*, well known in greenhouses for its orange-coloured flowers; *Feijoa Sellowiana*; *Philesia buxifolia*, a patch 4 ft. through; *Arbutus furiens*, an interesting and very distinct Chilean species; an interesting series of Cassinias; *Vaccinium Mortinia*, that dainty little evergreen which grows on the Andes of Ecuador almost on the equator; *Mitraria coccinea*, extraordinarily luxuriant; *Cyathodes empetrifolia*, a curious and pretty Epacrid from Australasia; *Prinsepia* (*Plagiospermum*) *sinense* was in flower, but does not appear likely to justify the praises bestowed on it by German periodicals (see *Kew Bull.* 1909, p. 354); *Ilex insignis*, perhaps the finest of all hollies; *Eupatorium Weinmannianum*, 9 ft. high.

There were fine plants also of things so typical of Irish gardens as *Tricuspidaria lanceolata*, *Embothrium coccineum*, *Drimys Winteri*, 30 ft. high, and *D. aromatica* with its handsome red twigs; *Olearia macrodonta* 20 ft. through; *Rhododendron Griffithianum* 10 ft. high; *Berberidopsis corallina* in rampant growth.

Kilmacurragh.

In the middle latitudes of Ireland there appears to be nowhere so remarkable a collection of rare and tender trees as that at Kilmacurragh in co. Wicklow. In point of numbers the collection does not equal that of Sir John Ross of Bladensburg, at Rostrevor, but, as will be seen from the following notes, the individual specimens have attained unusually fine dimensions, and they are almost invariably in the most robust health. The collection was largely formed by the late Mr. Thomas Acton, who was one of the keenest of plant lovers even in Ireland, where there is now a considerable community, encouraged and fostered by that admirably managed centre, Glasnevin. On Mr. T. Acton's death, Kilmacurragh descended to his nephew, Capt. Acton, in whose hands the collection of trees and shrubs is being admirably maintained.

One great charm of the Kilmacurragh plants is the semi-wild surroundings in which they are placed. They do not stand isolated on trim lawns, as at Castlewellan for instance, but occupy openings in the woodland, of which, indeed, they form a part. Each style of treatment has its charms, but to one like myself, whose habitual surroundings are of the neat, trim, and essentially garden type, the untrammelled order of things at Kilmacurragh appeals with perhaps undue force. And behind it all is that sense of satisfaction engendered by the rude health of the plants.

As elsewhere in Ireland, it is the plants of Tasmania, New Zealand, and Chile that predominate and give such interest to the garden, but they are supplemented by a strong contingent from the Himalaya. Of those belonging to Tasmania none are of greater interest than the three species of *Athrotaxis*: *A. cupressoides*, 20 ft. high; *A. laxifolia*, a pyramid 35 ft. high with a base 15 ft. in diameter; and *A. selaginoides* 35 ft. high, with a trunk 12 in. thick. Of New Zealand species the remarkable *Fuchsia excorticata*, 15 ft. high, its bark peeling off in long strips, was just coming into flower; *Senecio Greyi*, 6 ft. high and 10 ft. through, I do not remember to have seen so large elsewhere; *Griselinia littoralis* was 20 ft. high and formed a small tree.

Other particularly fine Australasian trees are *Nothofagus Cunninghami* 40 ft. high, its trunk 17 in. thick, probably the finest tree of its kind in the British Isles; *Nothofagus Moorei*, an evergreen species with larger leaves than most of these Southern beeches, 25 ft. high; *Pittosporum Buchanani* 15 ft. high.

Himalayan trees and shrubs are strongly represented at Kilmacurragh, and among them of course the rhododendrons stand first. The only species I saw in flower was *R. Shepherdi*, a brilliant red-flowered species in the way of *R. barbatum* but with larger calyx lobes; *R. Falconeri* is a wonderful bush 20 ft. high and more in diameter, and its close ally or variety *R. eximium* is also very vigorous; the tender *R. calophyllum* is useful in bearing its white funnel-shaped flowers later than most; *R. triflorum* and *R. campylocarpum* both 10ft. high; *R. grande* (*argenteum*) 16 ft. in height and in diameter. *R. lacteum*, one of the rarest of Chinese species, is 10 ft. high. Besides these there is a host of trees and bushes of

the red- and rose-flowered *arboreum* group. The rare *R. Keysii* is about 10 ft. high. Apart from rhododendrons the following stood out conspicuously good among Himalayan plants: *Abies Pindrow* about 50 ft. high with a trunk 2 ft. in diameter; *A. Webbiana* vividly blue-white beneath the leaves, also 2 ft. in thickness of trunk; *Magnolia Campbellii*, planted against a wall which it had long overtopped, being now 30 ft. high, its still leafless shoots bearing many flower-buds; *Tsuga Brunoniana*, rarest of hemlocks, 35 ft. high and more in width; *Pieris formosa*, bushes 15 ft. high. *Leycesteria formosa*, which we are accustomed to regard as an eminently staid bush, seems at Kilmacurragh to have lost control of itself and run riot as a sort of climber among tree branches 20 ft. from the ground.

Chilean Plants.—But after all, in overhauling one's notes, one finds that it is the Chilean trees and shrubs more than any others that give to the grounds at Kilmacurragh their great distinction. The vegetation of temperate South America seems to find in the Irish climate conditions as congenial to them as perhaps any other part of the British Isles affords; in this respect at any rate it equals the climate of Cornwall or the West of Scotland. Is there anywhere, for instance, a finer *Embothrium coccineum* than the one at Kilmacurragh, 40 ft. high with a trunk 18 in. thick and sending up suckers 20 ft. away? or than *Tricuspidaria lanceolata*, 20 ft. high and 15 ft. through? Of a remarkable series of Chilean conifers, mention must be made of the following: *Prumnopitys elegans* 30 ft. high with a trunk 1 ft. thick; two beautiful examples of *Podocarpus nubigena* 23 ft. high and 20 ft. through, the foliage of a charming, fresh green, the young shoots bright yellow; *Libocedrus chilensis* 30 ft. high and the very rare *L. tetragona* 20 ft. high; *Fitzroya patagonica* 25 ft. in height and diameter; *Podocarpus chilina* 25 ft. high, more in width, its trunk 15 in. in thickness.

Other notable Chilean plants are *Drimys Winteri* 35 ft. high; *Azara microphylla* 30 ft., in full blossom in February, its myriads of tiny blossoms strongly vanilla-scented; *Eugenia apiculata* (*Myrtus Luma*) 25 ft. high and 20 ft. through; *Laurelia aromatica*, a small tree which flowered and bore fruit several years ago, now 40 ft. or so high.

The Mexican sylva has two fine representatives in *Cupressus lusitanica* 40 ft. high, and *Abies religiosa*—one of the rarest of silver firs—its trunk 2 ft. in diameter.

Of better known things *Pinus Balfouriana* is 16 ft. high; *Eurya japonica* 7 ft.; *Cupressus pisifera squarrosa* 30 ft. and *C. thyoides* var. *leptoclada* 20 ft. high, the latter with several slenderly pyramidal branches growing outwards and giving it a diameter of 20 ft.; *Ilex Perado*, a Madeiran holly bearing much fruit, is 20 ft. by 25 ft. in diameter; a tea plant (*Camellia theifera*) is a bush 6 ft. through; *Leucothoe Catesbaei* is 7 ft. high.

Headfort.

The Marquis of Headfort has just founded a very extensive pinetum here. He has devoted an island of about 9 acres in

extent to the cultivation of as complete a collection of Coniferae as he has been able to get together. The climate of Headfort may not be quite so favourable to the growth of tender conifers as that of such places as Kilmacurragh, or Rostrevor, still less Fota, but the soil is excellent and the site moist—two factors very conducive to the well-being of the vast majority of conifers, especially spruces, firs, cedars, cypresses and members of the Taxaceae. The magnificent dimensions that such conifers as larch and common silver fir have attained in old plantations on the estate afford very encouraging prospects for the newly-founded pinetum, the first trees of which were planted on February 17. No one site will ever be found to suit all conifers—the moist mild conditions that so admirably meet the needs of Chilean, New Zealand and many British Columbian species cannot be perfectly adapted to the pines say of N.E. America, or the species from the hot and often arid regions of Arizona and other of the S.W. United States. But, on the whole, I believe the delightfully picturesque site selected by Lord Headfort will be found to support in health and vigour as large a number of species as any one place of similar size in the British Isles. It is appropriate to record the foundation of this collection in these pages, because it promises to be as complete in a botanical sense as any private collection in the Kingdom.

Avondale Forestry Station.

An interesting and useful work in experimental forestry has been initiated on the estate of the late Charles Stewart Parnell at Avondale, some 550 acres of which have been acquired by Government for the purpose. It lies at from 250 to 400 feet elevation and its eastern boundary is the River Avonmore, to the beautiful valley of which one part of the estate slopes abruptly. The chief object of the station is to test the value of exotic timber trees in Ireland and, incidentally, to provide a place of training for young men desirous of taking up forestry as a profession. The work was only started in 1905, and the eight years that have elapsed since then do not, of course, constitute a long enough period for any very striking or conclusive results to have been arrived at. In another ten or even five years the plots will have become more interesting. Much of the ground was originally pasture, and since it was laid down in forestry a strong growth of grass has established itself. This the young trees will in time destroy, as they already have done in some plots, but until then a genuine forest bottom cannot be said to have been established.

The scheme adopted is at once simple and effective. A broad avenue extends across the land, at each side of which have been planted one-acre blocks of various exotic trees. They are usually mixed with other trees intended to serve as temporary nurses, but sometimes they are planted in pure blocks. Standing out in the avenue opposite each block is a single isolated specimen of the same species as the one of which the block is composed. It has sufficient space to allow of its attaining the dimensions and form of the finest type of park tree.

The trees planted are those whose timber value in their native homes is known to be great, the general idea being to test their fitness for the climate of Ireland. The behaviour of many of the commoner timber trees is, of course, known, but the Station is endeavouring to demonstrate the value of rarer and lesser known trees under forest conditions. At present about 100 plots have been planted in this way.

As might be anticipated, a varying success has attended the different plantations, but the initial stages of growth do not always correspond in vigour to later ones. A bad starter may ultimately overtake and out-distance a good one. Among the most promising exotic growths at the present time are Japanese larch (*Larix leptolepis*), whose handsome brown shoots make beautiful breadths of colour; *Abies grandis*, whose growth much exceeded that of the common silver firs associated with it; Corsican pine looked well planted partly in association with larch, partly with spruce, and partly pure. *Cupressus macrocarpa* and *Juniperus virginiana* are growing rapidly, and *Tsuga Albertiana* is full of promise. The green-leaved Douglas fir planted on the low, sheltered flat near the river is in vigorous growth—much superior to the glaucous-leaved Colorado form.

In the vicinity of the house has been established an arboretum where the object is to show the value of trees in the garden and park, some being given sufficient space to enable them to develop as specimen trees, whilst others are associated in groups for landscape effect. Between 250 and 300 species have been planted here, over 100 of them being conifers.

Parnell's old house, interesting for its fine doors, ceilings and fireplaces, and for its balconied hall, is used as a museum and to provide class and lecture rooms for the students. The walled-in kitchen garden is given up to the raising of forest trees from seed, and now contains many thousands of trees, more especially of those kinds difficult to obtain through ordinary trade channels. A collection of Irish-grown timbers is being got together.

The course of training given at Avondale is strictly practical, that is to say, the young men have to use the spade, axe, and saw, and although the theoretical and scientific side of forestry is an important part of the training, the apprentices are workers first and foremost. A competitive examination is held in Dublin every September of those who present themselves as candidates for employment. The selected men are then sent to Dundrum, Co. Tipperary, for one year's manual training, after which they are further examined and reported on by the Forester in charge, and, if satisfactory, are passed on to Avondale for a further two years' course. Here they perform the ordinary work of the station during the day, and in the evening receive classroom instruction in forestry, elementary science, surveying, &c. They have free tuition, board and lodging, and are paid five shillings per week. The aim of the management is to turn out working foresters of a superior and intelligent type, and the young men preferred are those who satisfy the authorities not only of their general intelligence, but also that they are capable of manual labour and willing to do it.

The detailed particulars of the "Course of Training for Working Foresters" are reprinted in the footnote.*

XVI.—DECADES KEWENSES.

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LXXII.

711. **Cotylelobium lanceolatum**, *Craib* [Dipterocarpaceae] ; a *C. flavo*, Pierre, foliis minus coriaceis, indumento tenuiore distinguendum.

Folia lanceolata vel oblongo-lanceolata, apice acuminata, obtusiuscula, mucronulata, basi late cuneata vel rotundata, plerumque parum inaequilatera, 5·5–7·5 cm. longa, 2·1–2·7 cm. lata, subcoriacea, pagina superiore glabra, inferiore pilis brevibus stellatis costa densius nervis nervulisque parcius instructa, nervis lateralibus primariis utrinque 10–12 rectis angulo circiter 70° e costa ortis intra marginem anastomosantibus, nervis lateralibus secondariis numerosis primariis parallelis, costa supra leviter impressa subtus prominente, nervis nervulisque supra conspicuis vel subconspicuis

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* *Course of Training for Working Foresters.*

The Department provide a course of training in practical forestry, with a view to creating a class of working foresters suitable for employment on the Department's Forestry Centres, or on private estates throughout the country in general. An examination is held in Dublin in September of each year, for the purpose of selecting apprentices from the candidates presenting themselves. The examination includes Arithmetic, English Composition, and Dictation. Preference is given to those candidates who have had experience of forestry or other outdoor work, and are likely to adapt themselves to future training. Selected candidates are required to undergo a year's manual training at Dundrum, Co. Tipperary, where the Department are gradually clearing and re-planting a large area of woodland. They are paid at the rate of 14*s.* per week and provided with free lodgings in the bothy attached to the Centre. Instruction is given in Arithmetic, Business Correspondence, Mensuration, &c., together with the Elements of Practical Forestry, after working hours.

Upon completing one year satisfactorily at Dundrum, apprentices are required to undergo a further examination. Those who successfully pass this examination, and whose conduct and industry during the previous year are favourably reported upon by the Forester in charge, are then transferred to the Avondale Forestry Station for a further course of training. At Avondale the apprentices are required to take part in the general work of the Station by day, and receive classroom instruction in Forestry, Elementary Science, Surveying, &c., during the evenings. The full course at Avondale extends over two years, and while there the apprentices receive free tuition, board and lodging, in addition to a wage of 5*s.* per week. Apprentices who successfully pass through the course are given, as vacancies occur, employment as Working Foresters or Foreman on the Department's Forestry Centres, but the Department do not undertake to provide or guarantee employment to any time-expired apprentice.

The course of training may be terminated at any time by giving one week's notice on either side, and any apprentice who fails to conduct himself properly, conform to the rules or regulations laid down by the Department's officers, or make satisfactory progress in his training or class work, will be required to terminate his course at the discretion of the Department.

subtus prominulis, margine parum revoluta, petiolo 0·75–1·1 cm. longo tomentello suffulta. *Pedicelli* breves. *Sepala* lanceolata vel sublanceolata, apice acuta vel acutiuscula, 8–9 mm. longa, circiter 2·75 mm. lata, utrinque tomentella. *Antherae* 3·5 mm. longae, breviter apiculatae, connectivo dorso parce pubescente, filamentis brevibus. *Ovarium* hirsutum; stylus sepalis paulo brevior, inferne pubescens.

Siam. Described from a specimen communicated for identification by the Eastern Asiatic Co. who state that the wood is known in Siam as "Kiam wood."

712. **Wightia Lacei**, *Craib* [Scrophulariaceae - Cheloneae]; a *W. gigantea*, Wall., inflorescentiae indumento crassiore, corolla majore, fructu angustiore longiore recedit.

Arbor 30-metralis vel ultra (ex *Lace*); ramuli primo dense rufo-stellato-tomentelli, mox glabri, nodis parum compressi, cortice pallide brunneo parce lenticellato obtecti. *Folia* opposita, ovata, late oblonga vel subelliptica, apice breviter acuminata, obtusa, basi cuneata vel rotundato-cuneata, 6·5–13 cm. longa, 3·3–7·5 cm. lata, subcoriacea, supra glabra, subtus costa nervisque praecipue pilis stellatis brevibus parce instructa, nervis lateralibus utrinque 4–5 cum nervis transversis supra leviter immersis subtus conspicuis, petiolo 2–2·5 cm. longo densius rufo-stellato-tomentello suffulta. *Thyrsi* axillares, ascendentes vel mox arcuati, angusti, ad 13 cm. longi, rhachi pedunculoque dense rufo-stellato-tomentellis; pedunculi partiales breves; pedicelli ad 5 mm. longi. *Calycis* tubus 6 mm. altus, 8 mm. diametro, lobi 3, circiter 4 mm. longi et 6 mm. lati, acutiusculi. *Corollae* tubus 1·9 cm. longus, apice 1·2 cm. diametro, lobus infimus oblongus, 1 cm. longus, 8 mm. latus, lobi laterales 1·2 cm. longi, 9 mm. lati, duo supremi in unum ad medium bifidum 1·3 cm. longum 1·2 cm. latum lobis rotundatis connati; corolla extra stellato-pubescens, intra staminum insertionem prope pilosa. *Filamenta* longiora 4·3 cm. longa, breviora 3·7 cm. longa, basi pilosa. *Ovarium* 4 mm. altum, ad 4·5 mm. diametro; stylus 4·2 cm. longus. *Fructus* vix maturus, 4 cm. longus, 8 mm. latus, fuscus.

Indo-China. Burma: Amherst, near Kaw Ngaw stream, 900 m., *Lace*, 5653.

713. **Boea birmanica**, *Craib* [Gesneraceae - Cyrtandreae]; a *B. Swinhoei*, C. B. Clarke, calyce corollaque majoribus distinguenda.

Herba erecta, 10–21 cm. alta; caules solitarii, albo- vel mox cinnamomeo-lanati. *Folia* oblonga vel suboblonga, apice acutiuscula vel obtusa, basi acuminata, marginibus fere ad petioli basin decurrentibus, 3–5·5 cm. longa, 1·2–2·5 cm. lata, rigida, supra adpresse vel subadpresse pubescentia, subtus albo- vel mox fere cinnamomeo-lanata, nervis lateralibus utrinque 7 supra obscuris vel subobscuris subtus prominentibus, nervis transversis paucis subtus conspicuis, margine leviter crenata vel crenato-serrata; petioli foliorum oppositorum parum inaequales, ad 3·5 cm. longi, ut caules lanati, basi, praecipue foliorum inferiorum, caulem amplectentes. *Sepala* plus minusve sub anthesin cohaerentia, lineari-lanceolata, acutiuscula, parum inaequalia, ad 8 mm. longa, circiter 1 mm. lata, extra lanata, intra glabra. *Corolla* 1 cm. longa, tubo lobis duplo

longiore intra hic illic pilis albis longiusculis instructo, lobis subaequalibus, apice rotundatis ad 4 mm. latis. *Stamina* 2, glabra, staminodiis parvis. *Capsula* calyce persistente sesqui vel fere duplo longior, ad 3 mm. diametro, fusco-brunnea, glabra.

INDO-CHINA. Upper Burma: Maymyo Plateau, 1050 m., *Lace*, 5882.

714. **Ornithoboea Henryi**, *Craib* [Gesneraceae-Cyrtandreae]; ab *O. Parishii*, C. B. Clarke, labii inferioris lobis oblongis breviusculis obtusis recedit.

Herba, caule pilosulo; rhizoma 2–4 mm. diametro, foliorum delapsorum petiolorum basibus vestitum. *Folia* inaequilatera, late ovata vel subelliptica, apice, saltem juventute, acuminata, acuta, basi cordata, rotundata vel latere altero rotundata, altero late cuneata, 2–10·5 cm. longa, 2–5 cm. lata, membranacea, nervis lateralibus utrinque circiter 6 pagina utraque conspicuis, supra breviter pilosula, subtus costa nervisque puberula, petiolo ad 11 cm. longo pilosulo suffulta. *Inflorescentia* generis; pedicelli fructescentes ad 1·4 cm. longi, pilosuli. *Sepala* late lanceolata vel oblanceolata, apice acuminata, acuta, infructescentia reflexa, ad 6 mm. longa et 2 mm. lata, utrinque pilosula. *Corollae* tubus 4 mm. longus; labium inferum 5·5 mm. longum, basi 1·5 mm. latum, 3-lobatum, lobis oblongis apice rotundatis ad 3 mm. longis et 1·5 mm. latis, medio basi pilosum; labium superum e lobis duobus late oblongis apice rotundatis 2·5 mm. longis 2 mm. latis constitutum, basi linea lanata ad labii inferi basin producta instructum. *Stamina* 2; staminodia 3, tertium minutum. *Fructus* ad 1·5 cm. longus et 2·5 mm. diametro, pilosus.

CHINA. Yunnan: Puerh, 1350 m., *Henry*, 13,378.

715. **Ornithoboea Lacei**, *Craib* [Gesneraceae-Cyrtandreae]; ab *O. Parishii*, C. B. Clarke, foliorum nervis prominulis, floribus multo majoribus, labii inferioris lobis truncatis emarginatis facile distinguenda.

Rhizoma ad 11 cm. longum, 5–6 mm. diametro, ambitu plus minusve quadrangulare, petiolorum basibus persistentibus dense obtectum, apicem versus praecipue densius pilosum; caulis circiter 27 cm. altus, fere e basi floriferus, glanduloso-pilosulus. *Folia* valde inaequilatera, late ovata, apice acuminata, acutiuscula, basi rotundata, latere uno altero usque ad 7 mm. altius terminata, 3·5–8·7 cm. longa, 2·5–5·4 cm. lata, chartacea vel tenuiter chartacea, utrinque pilosula et subtus minute aureo-glandulosa, nervis lateralibus utrinque ad 10 supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, duplo-crenata vel crenato-serrata, petiolo ad 5·5 cm. longo glanduloso-pilosulo suffulta. *Inflorescentia* generis; pedicelli ad 1·5 cm. longi, glanduloso-pilosuli. *Sepala* inter se subaequalia, oblongo-oblanceolata vel late oblongo-oblanceolata, apice acuminata, acuta, ad 7 mm. longa, 3·5 mm. lata, utrinque pilosula. *Corollae* tubus 7 mm. longus, apice lanatus; labium inferum tubo aequilongum, e lobis tribus oblongis apice truncatis emarginatis inter se paulo inaequalibus (mediano lateralibus parum latiore) vix 5 mm. longis ad 3·5 mm. latis constitutum; labium superum e lobis 4 brevibus apice rotundatis inter se subaequalibus pseudo-constitutum (i.e. e lobis duobus altius bifidis

constitutum). *Stamina* 2, antheris majusculis ; staminodia 3, supero minuto. *Ovarium* circiter 2 mm. altum, dense glandulosum ; stylus 5 mm. longus. *Fructus* ad 1·5 cm. longus, 2·5 mm. diametro, glanduloso-pilosus et parce aureo-glandulosus.

INDO-CHINA. Upper Burma : Maymyo Plateau, 1050 m., *Lace*, 5926.

716. **Thunbergia Lacei**, *Gamble* [Acanthaceae-Thunbergieae] ; ab affini *T. grandiflora*, Roxb., ramulis longe setosis, foliis majoribus palmatis molliter pubescentibus, floribus axillaribus pedunculatis recedit.

Frutex scandens ; ramuli pubescentes et longe setosi, setis saepe fere 5 mm. longis et transverse divisis. *Folia* palmata (juniorave ovato-cordata, vix lobata), 7–11-lobata, basi profunde cordata, apice acuta, mucronata, fere ad 20 cm. longa et lata, pagina utraque molliter pubescentia, margine praeter lobos integra ; costae e basi 7, mediana utrinque nervis circiter 3 patentibus, lateralibus cito divisis, reticulatione subtus conspicua ; petiolus ad 13 cm. longus, basi incrassatus tortusque, conspicue pubescens et setosus. *Flores* 1–4, e foliorum axillis ; pedunculi crassi, circa 5 cm. longi, infra flores expansi, setosi ; bracteae 2, ovato-oblongae, acuminatae, 3 cm. longae, deciduae. *Calyx* florifer subinteger vel parce crenulatus, pubescens, fructifer auctus, lobis circiter 5 acuminatis. *Corolla* coerulea, fauce flava ; tubus inferne constrictus, deinde campanulatus, ad 3 cm. longus ; lobi rotundati, ad 4 cm. diametro. *Stamina* 4 ; filamenta lata, basi solum pubescentia ; antherae oblongae, basi calcaratae, interdum 2 breviores calcare uno brevi altero longiore, setosae ; connectivum in apicem conicum productum. *Ovarium* depresso-conicum ; stylus gracilis, ad 2 cm. longus ; stigma infundibulare, bilobum. *Capsula* globosa, circiter 1 cm. longa, in rostrum 2–3 cm. longum producta. *Semina* 4, triangularia, facie exteriore corrugata, interiore plana, 7–9 mm. lata.

INDO-CHINA. Upper Burma : Maymyo Plateau, 1050 m., *Lace*, 5419 ; Southern Shan States : Maha Choung ; Loilong, 600 m., *Robertson*, 97.

717. **Helicia Curtisii**, *Gamble* [Proteaceae - Grevilleae] ; ab *H. robusta*, Wall., cui quoad folia affinis, racemis brevioribus, perianthio minore graciliore et squamis hypogynis liberis recedit.

Arbor ad 6–9 m. alta ; ramuli teretes, pallide brunnei, glabri. *Folia* oblanceolata, apice obtuse acuminata, basi longe attenuata, 12–18 cm. longa, 4–6 cm. lata, chartacea, supra glabra, siccitate olivacea, infra pallida, rufescentia, costa gracili infra prominente, nervis lateralibus utrinque 8–10 marginem versus curvatis et ibi arcuatim junctis infra praecipue prominentibus, nervis transversis paucis reticulationem areolatam formantibus, margine supra medium conspicue serrata, serraturis acutis aliquando 1–2 in 1 cm., infra medium integra ; petiolus circiter 1 cm. longus, laminae marginibus fere ad basin decurrentibus. *Paniculae* racemiformes, axillares, graciles, 15–20 cm. longae, rhachi ramulis pedicellisque primo parce ferrugineo-puberulae, tandem glabrescentes ; ramuli 2 mm. longi, biflori, pedicellis 2 mm. longis ; bracteae bracteolaeque minutae, caducae. *Perianthium* in alabastro clavatum, gracile, tenue, 7–8 mm. longum, lobis oblongis acutis ; squamae hypogynae

liberae, ovatae, obtusae, 1 mm. longae. *Stamina* 4, antheris oblongis, connectivo apiculato, filamentis brevibus complanatis. *Ovarium* ovoideum, ferrugineo-villosum, stylo 5–6 mm. longo gracillimo, stigmate anguste cylindrico.

Malay Peninsula. Penang: Penara Bukit, *Curtis*, 3020.

718. **Helicia Scortechinii**, *Gamble* [Proteaceae - Grevilleae]; *H. excelsae*, Blume, affinis sed foliis siccitate fere nigris, petiolo breviore, racemis brevibus differt.

Arbor (?) ramulis teretibus pallide brunneis, junioribus paulo puberulis. *Folia* oblanceolata, apice abrupte caudato-acuminata, basi cuneata, 12–18 cm. longa, 4–6 cm. lata, chartacea, supra siccitate fere nigra, glabra, infra perparce fusco-pubescentia, costa gracili infra prominente, nervis lateralibus utrique 8–10 marginem versus curvatis et ibi arcuatim junctis infra prominentibus, nervis transversis irregularibus ramosis reticulationem irregularem formantibus, margine basin versus integra, apicem versus ad partem tertiam serrata; petiolus circiter 1 cm. longus, laminae marginibus fere ad basin decurrentibus. *Paniculae* racemiformes (juniores tantum) e foliorum delapsorum axillis ortae, singulae vel geminae, minute ferrugineo-hirsutae; pedicelli breves, biflori; bracteae ovatae, acuminatae, 2 mm. longae; bracteolae 1 mm. longae. *Perianthium* in alabastro clavatum, squamis hypogynis ovatis glabris liberis. *Ovarium* glabrum, stylo brevi, stigmate cylindrico-clavato.

Malay Peninsula. Perak, *Scortechini*, 467.

719. **Amomum Robertsonii**, *Craib* [Scitamineae-Zingibereae]; ab affini *A. dealbato*, Roxb., floribus minoribus, staminodiis majoribus, anthera minore recedit.

Folia late oblanceolata vel oblongo-oblanceolata, apice acuminata, acuta, basi obtusa vel in petiolum brevem attenuata, 15·5–33 cm. longa, 5·5–8·5 cm. lata, supra glabra, subtus imperfecte sericea; ligula ovato-oblonga, ciliata, dorso breviter densius pubescens, circiter 5 mm. longa; vaginae infimae 4, ut superiores puberulae. *Spicae* radicales, subsessiles, densae, subglobosae; bracteae exteriores late ellipticae, vix 2 cm. longae, 1·5 cm. latae, dorso tenuiter pubescentes, interiores lineari-lanceolatae, dorso parce pubescentes. *Calyx* circiter 2 cm. longus, parce pubescens; lobi late lanceolati, acuti, cornuti, ad 7 mm. longi. *Corollae* tubus circiter 2 cm. longus, superne praecipue substrigosus; lobi inaequales, ad 1·4 cm. longi. *Staminodia* lateralia fere filiformia, 1·5 mm. longa; labellum obovatum, circiter 1·8 cm. longum, et 1 cm. latum, intra medio strigosum, extra glabrum; anthera circiter 1 cm. longa, apice connectivo producto coronata. *Ovarium* vix 5 mm. altum, dense albo-hirsutulum.

Indo-China. Upper Burma: Southern Shan States, in pine and mixed forest, 1350 m., *Robertson*, 150.

720. **Paspalum paschale**, *Stapf* [Gramineae-Paniceae]; affine *P. suffulto*, Mikan, sed rhachibus spicarum latioribus, spiculis rhachium flexuris insertis haud patulis paululo majoribus acutioribus distinctum.

Gramen perenne, caespitosum. *Culmi* florentes ad 45 cm. alti, cum innovationibus dense fasciculati, fasciculis rhizomati brevi insidentibus, inferne compressi, paucinodi, praeter nodos inferiores

barbatos glabri, e foliorum plurimorum axillis ramos erectos edentes. *Folia* basalia 5–7 vaginis valde compressis in dorso carinatis glabris vel saepius ad latera et ora versus pilosis ; ligulae brevissimae, ciliolatae ; laminae lineares, arcte plicatae, in statu plicato a latere visae apice curvatae, subapiculatae, 14–20 cm. longae, 5–7 mm. latae (explicatae), rigidulae, glabrae vel sparse villosae. *Spicae* 3–4 subdigitatae, 6–8 cm. longae, strictae ; rhachis flexuosa, 0·5 mm. lata, ad margines scabridula. *Spiculae* circiter 2 mm. distantes, in flexuris rhachis receptae, 2·5–3 mm. longae, oblongae, acutae, pallidae. *Gluma* inferior suppressa, superior spiculam aequans, ad latera viridula, caeterum hyalina, apicem versus et saepe ad nervos inferiores pilosula, nervis margines versus utrinque 2, brevibus tenuibus obscuris 3–4 intermediis additis. *Anthoecium* inferum ad valvam glumae superiori simillimam nisi tenuius nervosam reducta. *Anthoecium superum* 2–2·5 mm. longum, valva paleaque firmulis obtusis albidis.

Easter Island. Common on the hill of the middle island, Comm. *F. Fuentes.*

XVII.—DIAGNOSES AFRICANAE. LIII.

1431. **Mesembryanthemum minusculum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. minuto*, Haw., sed corpusculis convexis nec depresso-emarginatis purpureo-maculatis et minutissime albo-punctatis area centrali minute puberula differt.

Herba parva, acaulis, succulenta, dense caespitosa, fere glabra, aphylla. *Folia* in corpuscula obovoidea, apice convexa, 5–8 mm. diametro fusa, area minute puberula circumdata et in annulo atro-virente inclusa, viridia vel lateribus purpureo-tinctis, purpureo-maculata vel atro-viridi-maculata et minutissime albo-punctata, fissura 1–2 mm. longa. *Calyx* in corpusculum inclusus. *Corolla* gamopetala, 2·5 cm. diametro, pulchre rubro-purpurea, luteo-oculata ; tubus supra superficiem plantae 3–6 mm. exsertus, compressus, 2 mm. latus, sordide aurantiaco-ruber ; petala exteriora circiter 16–18, sub-uniseriata, 12 mm. longa, 1·5–3 mm. lata, lineari-cuneata, obtusa vel subdentata ; interiora circiter 6, uniseriata, 3 mm. longa, linearia, acuta, auriantiaco-lutea. *Stamina* inclusa, lutea.

South Africa : without locality, described from living plants received at Kew from *Mr. N. S. Pillans* in 1908.

The flowers of this species, when once expanded, remain open until they fade, irrespective of sunshine or dull sunless weather and last 4–5 days.

1432. **Mesembryanthemum fraternum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. minuto*, Haw., sed corpusculo punctato et floribus minoribus differt.

Herba parva, acaulis, succulenta, dense caespitosa, aphylla, glabra. *Folia* in corpuscula obconica, apice late rotundata vel emarginata, 0·7–1 cm. diametro fusa, pallide cinereo-viridia, haud nitida, punctis atroviridibus demum purpureis irregulariter conspersis notata, fissura haud ciliata. *Calyx* in pedunculo 1–2 mm. longo exsertus, 4-lobus ; lobi 2 mm. longi, erecti, oblongi, obtusi, membranaceo-marginati. *Corolla* gamopetala, 1·5 cm. diametro ; tubus

6 mm. longus, luteus ; petala 21–28, biseriata, subaequalia, patula, 6 mm. longa, 1–1·5 mm. lata, linearia, obtusa, pulchre rosea, basi lutea, leviter nitida. *Stamina* breviter exserta ; filamenta aurantiaca ; antherae luteae. *Stylus* staminibus sublongior, filiformis, apice minute 4-lobus, rubro-aurantiacus.

South Africa. Little Namaqualand: common on decomposed granite on the upper north-western slopes of hills south-west of Chubiessies, *Pearson*, 6177.

Described from living plants collected during the Percy Sladen Expedition to the Orange River in 1910–1911, by Prof. H. H. W. Pearson, and sent to the Royal Botanic Gardens, Kew, where it flowered in July and August, 1912.

The flowers seen opened in the morning of a day on which there was an entire absence of sunshine, and the temperature in the open air only 60° Fahr. They did not close, so far as I observed, unless during the night, but remained open until they faded, the weather being very dull and cloudy all the time.

1433. **Mesembryanthemum globosum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. minimo*, Haw., sed corpusculis majoribus apice convexis nec depresso-emarginatis epunctatis, corolla pallide rosea tubo breviore.

Herba parva, acaulis, succulenta, dense caespitosa, ubique glabra, aphylla. *Folia* in corpuscula globosa, apice convexa, 1–1·3 cm. diametro fusa, glauco-viridia (haud glauca), emaculata et epunctata, fissura centrali 3 mm. longa, nec depressa, sed tempore florentis in tuberculum parvulum elevata. *Pedunculus* exsertus, 3 mm. longus, compressus, 2–2·5 mm. latus, albidus. *Calyx* 4-lobus, albidus vel pallide albo-virens, apice pallide rubro-tinctus ; lobi 2–3 mm. longi, oblongi vel ovati, obtusi, membranaceo-marginati. *Corolla* gamopetala, 1·8–2 cm. diametro, subinfundibuliformis, pallide rosea, albo-oculata ; tubus 5 mm. longus ; petala 40–55, circiter 3–4-seriata, exteriora 8–9 mm. longa, interiora 5 mm. longa, linearia, obtusa vel acuta, integra. *Stamina* vix exserta, 5–6-seriata, erecta, lutea. *Styli* 4, filiformes, erecti, 8–9 mm. longi, ad medium connati, apice lutei.

South Africa. Little Namaqualand : lower side of the northern aspect in River Valley, 3 miles west of Garies, *Pillans and Pearson*, 5582.

Described from a living plant sent to Kew by Prof. Pearson in 1911. The flowers of this species open in the morning and begin to close about 2 p.m. and are quite unaffected by sunshine or dull sunless weather. Each flower opens successively for 5–7 days.

1434. **Mesembryanthemum odoratum**, *N. E. Brown* [Ficoideae-Mesembryeae] ; affinis *M. ficiformi*, Haw., sed corpusculis punctis paucioribus et floribus multo majoribus odoratis differt.

Herba parva, acaulis, succulenta, aphylla, caespitosa, glabra. *Folia* in corpuscula obconico-obcordata, compressa, 2–3 cm. alta, ad 2·5 cm. lata fusa, glauco-viridia, punctis atroviridibus in lineas subbicruciatim dispositis notata. *Calyx* in pedunculo 2–3 mm. longo exsertus, compressus, 4-lobus ; tubus ad 4 mm. latus ; lobi 2·3–3 mm. longi, oblongi, obtusi, membranacco-marginati. *Corolla* vesperem versus expansa, odoratissima, 1·8–2·5 cm. diametro, pulchre carneo-purpurea, nitida ; petala sub 80, subbiseriata, 0·8–1 cm. longa,

1 mm. lata, integra vel apice emarginata. *Stamina* vix exserta, albida. *Styli* 4, inclusi, staminibus multo breviores, lineares, obtusi.

South Africa. Worcester Division; mountains near Worcester, *Cooper*.

Described from a living plant, which has been in cultivation for over 40 years but never previously described. It was introduced in 1862 by Mr. Thomas Cooper, who informed me that he believed that he collected it at the above-mentioned locality. Its flowers open about 4 p.m. and are closed the next morning, but after opening and closing for 3 days, they do not close again, but remain expanded, with the petals spread over the top of the plant until they wither, each flower lasting altogether for 6 or 7 days. They are most delightfully scented, very much like cloves.

1435. **Mesembryanthemum evolutum**, *N. E. Brown* [Ficoideae-Mesembryeae]; species ab omnibus distinctissima.

Herba nana, succulenta, densissime caespitosa. *Plantulae* (vel rami) 2–4-foliatae, 6–7 mm. diametro. *Folia* erecta, basi connata, parte libera 2–3 mm. longa, semiglobosa, facie interiore plana, dorso valde convexa, marginibus ciliatis, viridia, emaculata. *Calyx* exsertus, 5-lobus, glaber; lobi 3–4 mm. longi, oblongo-lanceolati, obtusi, virides, basi purpureo-tincti. *Corolla* 16 mm. diametro; petala circiter 36, biseriata, 6–6·5 mm. longa, linearia, obtusa vel minute emarginata, roseo-purpurea, leviter nitida. *Stamina* numerosa, conniventia, exteriora filiformia, ananthera, inferne albida, superne atropurpurea. *Styli* 5 erecti, staminibus subaequilongi, subulati.

South Africa. Little Namaqualand, without precise locality, collected during the Percy Sladen Expedition to the Orange River by *Prof. Pearson*, no. 5946.

Described from a living plant, sent to Kew by Prof. Pearson, which flowered in October, 1912. This minute species is quite distinct from all others hitherto described, and connects those belonging to the group having two leaves fused into a small obconic body with those in which there are two or four free leaves.

1436. **Kalanchoe sexangularis**, *N. E. Brown* [Crassulaceae]; affinis *K. paniculatae*, Harv., sed caule sexangulari et cymis in paniculam superpositis distinctissima.

Herba succulenta, circa 1 m. alta. *Caulis* simplex, strictus, sexangularis, basi 1·3 cm. crassus, glaber, viridis. *Folia* opposita, petiolata, glabra, viridia, haud glauca; petiolus 1–2 cm. longus, 6–8 mm. latus, supra canaliculatus, subtus carinatus; lamina foliorum inferiorum 7–9 cm. longa, 5·5–8 cm. lata, elliptica vel suborbicularis, apice obtusissima vel rotundata, basi in petiolum brevissime et abruptissime cuneata, obscure vel distincte crenata, plana vel ad apicem convexa, marginibus reflexis, foliorum superiorum gradatim minora, angustiora, concava. *Cymae* pedunculatae, adscendentes, 3·5–5 cm. latae, in paniculam 20 cm. longam superpositae, glabrae, virides, haud glaucae; pedunculi 3–5 cm. longi. *Bracteae* 1–3 mm. longae, lanceolatae, acutae. *Pedicelli* 3·5–5 mm. longi. *Calyx* 3 mm. longus, fere ad basin 4-lobus; lobi ovati, acuti. *Corolla* parva, glabra, flava, basi viridis; tubus 1 cm. longus, elongato-conicus, 4-angularis; lobi 2·5 mm. longi, suborbiculares vel rotundato-ovati, apiculati. *Stamina* inclusa.

South Africa. Transvaal? Described from a living plant sent by *Mr. Thorncroft* to Cambridge Botanic Garden, and communicated to Kew by R. I. Lynch.

1437. **Ceropegia Ledgeri**, *N. E. Brown* [Asclepiadaceae - Ceropegieae]; affinis *C. vincaefoliae*, Hook., sed pedunculis glabris, corollae tubo purpureo et corona diversa facile distinguitur.

Herba volubilis. *Caulis* 2 mm. crassus, glaber. *Folia* glabra, pulchre olivaceo-viridia; petioli 2 cm. longi; lamina 4·5–6·5 cm. longa, 2·2–3·8 cm. lata, elongato-ovata, acuta, basi rotundata vel levissime subcordata, integra. *Pedunculi* axillares, solitarii, 1·6–2 cm. longi, 1·25 mm. crassi, umbellatim 3–4-flori. *Pedicelli* 1–1·5 cm. longi, glabri, purpureo-punctati. *Sepala* 4 mm. longa, subulata, acuta, glabra. *Corollae* tubus curvatus, 2·3 cm. longus, utrinque glaber, sed intra ad apicem inflationis annulo pilorum crispatorum alborum ornatus, basi ellipsoideus et 5 mm. diametro, intra pallidus, purpureo-maculatus, medio cylindricus et 2 mm. diametro, intra atro-purpureus, extra pallidus, apice infundibuliformis et 9 mm. diametro, fusco-purpureus, intra pallidus, minutissime fusco-purpureo-punctatus; lobi 1·1–1·2 cm. longi, erecti, apice leviter connati, glabri, marginibus in parte superiore pilis simplicibus atropurpureis ciliatis, superne atropurpurei, inferne pallidi, minutissime purpureo-punctati. *Corona exterior* 10-dentata, glabra; dentes 1·25 mm. longi, erecti, lineari-subulati, purpureo-punctati. *Coronae interioris* lobi 2 mm. longi, arcte conniventes, erecti, lineares, glabri, purpurascentes.

The origin of this plant is unknown. It was purchased by Mr. Walter Ledger, of Wimbledon, some years ago, from Mr. W. Bull, under the name of *C. Gardneri*, from which species it is entirely different. But as it bore that name, it probably is a native of the same region and doubtless was introduced from some part of India or the Malay Archipelago. Mr. Ledger has assiduously collected and cultivated the species of this interesting genus for many years.

1438. **Caralluma Burchardii**, *N. E. Brown* [Asclepiadaceae-Stapelieae]; affinis *C. europaeae*, N. E. Br., sed corollae lobis immaculatis intra pilis albis dense obtectis differt.

Caules succulenti, erecti, ramosi, 7–50 cm. longi, 1·5–2 cm. crassi, subacute tetragoni, angulis dentatis; dentes (folia rudimentaria) 1 mm. prominentes, deflexi, late deltoidei. *Flores* prope apicem caulorum fasciculati, sessiles. *Sepala* 3 mm. longa, lanceolata, acuta, glabra. *Corolla* rotata, 1·3 cm. diametro, intra alba, immaculata, pilosa, extra olivaceo-brunnea (ex *Burchard*); lobi 4 mm. longi, 3·5 mm. lati, ovati, acuti. *Corona* exterior cupuliformis, 10-dentata, lutea; dentes 1 mm. longi, erecti, subulati; interior 5-loba, lutea; lobi 1–1·25 mm. longi, antheris incumbentes et eas aequantes, lineares, obtusi. *Folliculi* 7–8 cm. longi, 7–8 mm. crassi, teretes, acuti, glabri, purpureo-vittati. *Semina* 6 mm. longa, 3·5 mm. lata, oblongo-obovata, plana, late marginata, glabra, pallide brunnea.

Canaries. Common on recent lava streams, tops of volcanoes and on clay in the whole of the northern part of the island of Fuerteventura, but not yet found in the Handia Mountains, *Dr. O. Burchard.*

This is closely allied to *C. europaea*, N. E. Br., and *C. maroccana*, N. E. Br., differing in its unspotted flowers, which are covered with white hairs inside, and also in its corona. It is an interesting discovery, as it is the first record of this genus in the Canary Islands. Living plants and flowering specimens in formalin have been kindly sent by Dr. Burchard to the Royal Botanic Gardens, Kew.

1439. **Euphorbia Eustacei**, *N. E. Brown* [Euphorbiaceae-Euphorbieae]; species ab omnibus habitu et spinis longis albis distinctissima.

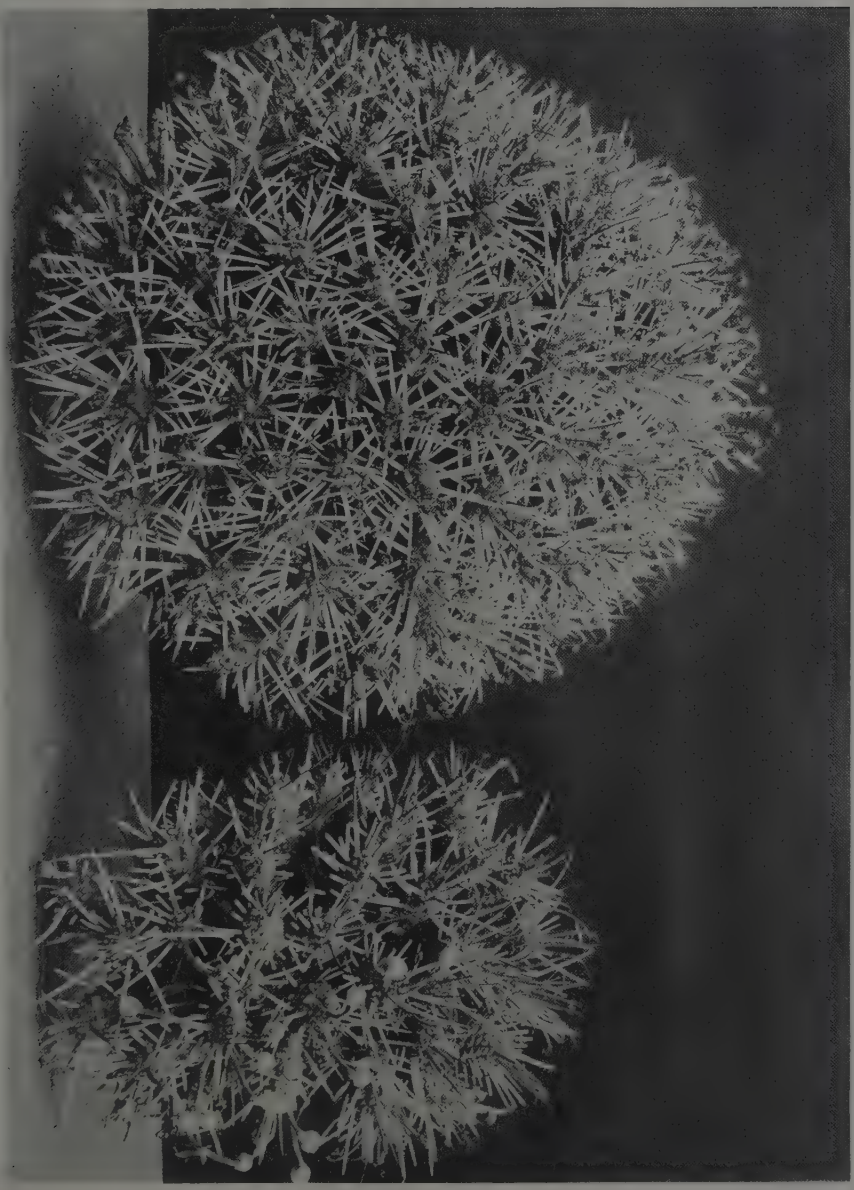
Planta succulenta, spinosissima, hemispherico-caespitosa, 10–15 cm. alta, 20–30 cm. diametro, dioica. *Rami* conferti, 4–11·5 cm. longi, 1·7–2 cm. crassi, cylindrici, vix tuberculati, sed lineis impressis areolas hexagonas circumdantibus notati, glabri, pallide virides. *Folia* petiolata, 2–3·2 cm. longa, 5–7 mm. lata, oblanceolata, obtusa vel subacuta, mucronata, e medio in petiolum 4–6 mm. longum attenuata, minutissime puberula, decidua. *Spini* solitarii, patuli, 2–5 cm. longi, albi, glabri. *Pedunculi* solitarii, 2–3 cm. longi, apice bracteis 3–4 verticillatis inferne bracteis 2–3 sparsis instructi. *Bracteae* superiores 3–5 mm. longae, 2–3·5 mm. latae; oblongae vel obovato-oblongae, inferiores minores. *Involucrum* 4–6 mm. diametro, subcampanulatum, glabrum vel minutissime puberulum; glandulae 1·5–2·5 mm. latae, cuneato subrectangulares, integrae. *Ovarium* subsessile, minutissime velutino-puberulum; styli inferne in columnam 1·5 mm. longam connati, superne in ramos 1·3 mm. longos patulos apice bifidos divisi. *Capsula* brevissime pedicillata, 6 mm. diametro, depresso-globosa, minutissime velutina. *Semina* 3 mm. longa, ovoidea, obscure et minute rugulosa, cinerea.

South Africa. Laingsburg Division: near Matjesfontein, *E. Pillans*.

The above description and accompanying figures are made from living male and female plants sent to the Royal Botanic Gardens, Kew, by Mr. Eustace Pillans of Cape Town, to whom and to his son, Mr. Neville S. Pillans, Kew is also indebted for a large number of other interesting plants; their services are commemorated by naming this and the following very distinct species after them. The figures of *E. Eustacei* represent the plants as seen from above, the pots containing them being laid upon their sides. The larger figure is that of the male and the smaller that of the female plant. Viewed from the side, the plants have the form of hemispherical spiny cushions, the larger of which is about one foot in diameter. The stems are pale green at the younger parts and the spines very white, so that the contrast is rather pleasing, and the whole appearance of the plant is entirely distinct from any other species in cultivation.

1440. **Euphorbia Pillansii**, *N. E. Brown* [Euphorbiaceae-Euphorbieae]; affinis *E. stellaespinae*, Haw., sed caule transverse zonato-variegato, angulis paucioribus, spinis validioribus et involucro majore differt.

Planta succulenta, 10–15 cm. alta, basi ramosa, aphylla, spinosa, glabra, dioica. *Caules* vel rami 3–5 cm. crassi, obtusissime 7-angulati, zonis alternis viridibus et atroviridibus transverse notatis,



EUPHORBIA EUSTACEI.

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EUPHORBIA PILLANSII.

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angulis crenatis. *Folia* rudimentaria 1 mm. longa, deltoidea, acuta, decidua. *Spini* solitarii, apice stellato-ramosi vel simplices, 8–17 mm. longi, 1·5–2 mm. crassi, glabri, cinerei. *Pedunculi* erecti, 7–12 mm. longi, 1–2·5 mm. crassi, umbellatim 2–6-flori vel interdum uniflori, minute bracteati. *Pedicelli* 5–6 mm. longi, apice bibracteati. *Bracteae* 2–3 mm. longae et latae, subquadratae, apiculatae, glabrae. *Involucrum* 5–6 mm. diametro, late campanulatum, glabrum, viride, glandulis 5 transverse ellipticis vel sub-reniformibus integris atro-viridibus. *Ovarium* non vidi.

South Africa. Ladismith Div.: near Doornkloof River, between Muis Kraal and Ladismith, *N. S. Pillans*.

The description and figure of this species are made from a living plant sent by Mr. Neville S. Pillans to the Royal Botanic Gardens, Kew, where it flowered in Dec., 1912. *E. Pillansii* is allied to *E. stellaespina*, Haw., but is well distinguished from that species by its much fewer angles, stouter spines, and the transverse pale greenish bars upon its stems. The figure represents the plant of its natural size.

XVIII.—CASCARA SAGRADA.

(*Rhamnus Purshiana*, DC.)

W. J. Bean.

Attention has already been called in these pages to the possibility of this drug proving a remunerative culture in the British Isles (see *K. B.* 1908 p. 429) and the question has aroused considerable interest in various parts of the country. In 1908, seeds of *Rhamnus Purshiana* were distributed from Kew to about twenty establishments in England, Scotland and Ireland. Reports have just been received from most of the recipients as to the germination of the seeds, also notes on the behaviour of the plants. The seeds as received from America do not appear to have had a high germinating power, and even the most successful results do not show that more than 35 per cent. were fertile. The seeds appear to have germinated best when the stiff pulp (the dried fruit) in which the seeds, as received, are embedded is removed before sowing. The most successful results both as to germination and growth have been obtained in the garden of Mr. Collis-Sandes at Oak Park, Tralee, Ireland, where some of the plants raised from the 1908 seed are already 9 feet high, 8 feet in diameter, and 6 inches in girth of stem. At Fota they are 7 feet, at Rossdohan 8 feet, and at Glasnevin 6 feet high. The tree is also succeeding particularly well in the south-west of Scotland with Sir Herbert Maxwell, who had six plants from Kew in 1908. Plants at the Edinburgh Botanic Garden are thriving well.

The species, like our native *R. Frangula*, is capable, evidently, of very soon arriving at the fruiting stage, for Sir Herbert Maxwell's plants bore a plentiful crop of berries in 1911, and although his plants are two or three years older than the plants raised from seed in 1908, they show that, in favourable circumstances, trees five or six years old will produce fruit. It appears

probable, therefore, that once the tree becomes established its propagation will offer no difficulties. It is pretty certain that seeds sown directly from the tree will give a higher percentage of germination than those that have been kept an indefinite time in seed-rooms. Sir Herbert Maxwell did not save his seed, but that gathered from older trees at Kew has germinated well.

This Rhamnus seems to prefer a light to a heavy soil, and wherever it has been tested, has made the best growth in the former. In the cold district of Aldenham House, Elstree, Herts, Mr. Vicary Gibbs reports that the plants raised from the 1908 seed, although very healthy, are only 2 feet high planted in heavy soil; and at Woburn, Mr. Spencer Pickering reports that in a light soil the plants have done much better than in a heavy one, some of last year's growths in the former being 3 feet long. At Colesborne, in Gloucestershire a cold limestone district, Mr. H. J. Elwes informs us that the 1908 plants are quite hardy and healthy, but grow slowly—about 2 feet only in three years.

Of the hardiness of the species in the greater part of the British Isles, there is, we believe, no doubt. At Kew, the trees raised from seed in 1891 withstood the great frosts of February, 1895, without being in the least affected, although the minimum temperature for a few nights ranged between 1° and 6° Fahr.

In connection with the possibility of establishing plantations of *R. Purshiana*, attention may again be called to the fact that it has been found possible at Kew to strike cuttings by taking them in July. The cuttings should be of the new shoots 3–4 inches long with a "heel" of older wood at the base (see *K. B.*, 1912, p. 393).

As already indicated in the *Kew Bulletin* (1908, p. 429), the bark collected from the trees at Kew has been shown to possess medicinal properties indistinguishable from those of American Cascara. It has been suggested to us that it by no means follows that the bark of trees grown in the damp, less sunny parts of the British Isles will be equal in quality to the Kew product—the Thames Valley being one of the sunniest and driest districts in the Kingdom. This, of course, is a matter for experiment.

At the prices at present obtainable for Cascara Sagrada, it scarcely seems likely that it would prove a paying crop. In Bulletin No. 139, p. 40, issued by the Bureau of Plant Industry, United States Department of Agriculture, it is stated that one tree is estimated to yield approximately 10 lbs. of bark. As the price then (in 1908) paid to collectors for the bark was 3 to 4½ cents. per lb., it follows that the produce of one tree barely amounted to two shillings. At this price the cultivation of the tree cannot be remunerative, especially if a system of collecting the bark is adopted (as in America) that proves fatal to the tree.

The bark of the tree grown at Kew proved very difficult to remove, and had to be scraped or cut off rather than peeled, but this was done in February. The collecting season in America, which opens about the end of May or early in June and closes about the end of August, covers the period of the greatest flow of sap. The bark evidently comes away easily enough then, as it is brought to market in "quills" or rolls.

Another factor to be taken into consideration is that Cascara bark should be at least one year gathered before it is used.

There is every probability that the price of this drug will rise considerably. In 1908 the world's consumption was said to be two millions of pounds annually, which means that 200,000 trees would have to be destroyed yearly to maintain the supply. As no steps are being taken in America to renew the trees, it is evident that the natural supplies must fail within a limited time. As Cascara Sagrada is a most valuable laxative with unique properties, it appears likely that the demand for it would continue with greatly enhanced prices.

An interesting question is whether some means of utilising the younger parts of the tree, say the one- or two-year-old shoots, can be devised, which would leave the tree as a whole uninjured. The year-old bark is said to be equal in medicinal value to that on older wood, and if the tree were grown in plantations whence an annual crop of branchlets could be taken, its cultivation and utilisation would be much simplified and cheapened.

XIX.—MISCELLANEOUS NOTES.

Mr. A. H. Kirby, B.A., Scientific Assistant, Imperial Department of Agriculture for the West Indies, has been appointed by the Secretary of State for the Colonies, Assistant Director of Agriculture in Southern Nigeria.

Mr. F. W. South, B.A., Mycologist and Agricultural Lecturer, Imperial Department of Agriculture for the West Indies, has been appointed by the Secretary of State for the Colonies, Chief Agricultural Inspector, Federated Malay States.

Mr. T. D. Maitland, Curator in the Agricultural Department, Southern Nigeria (*K. B.* 1910, p. 64), has been appointed by the Secretary of State for the Colonies a District Agricultural Officer in the Uganda Protectorate.

Larix occidentalis.—It may be of interest to put on record for future reference the making of a plantation of this larch in the grounds of Queen's Cottage at Kew. In February, 1909, a parcel of seed was presented to Kew by Mr. A. Henry. The seeds germinated well, and about 600 plants were raised in the Arboretum nursery. Having reached a size at which it became necessary to find permanent quarters for them, it was decided to make a plantation in the Queen's Cottage Grounds, where one of the clumps of miscellaneous trees was cleared away for the purpose. Some 400 trees were put out on March 12th and 13th, 1913, on a piece of ground one-third of an acre in extent, which enabled the young trees to be set out about 6 feet apart. Except for a liability to be injured by late spring frosts, which causes a number of "leaders" to form instead of one, these young larches are succeeding well at

Kew. During the summer of 1912, most of the plants made leading growths 15 to 18 inches long, some of them 24 to 28 inches. The susceptibility to spring frosts is likely to be greater in a flat, low-lying situation like Kew, which is scarcely above the level of high tides, than in elevated ones; nor are the frosts so likely to affect plants above 6 feet in height. The old trees in the pinetum at Kew, which are the finest in the country at the present time, show no signs of having been checked by frost, the stems being straight and the tallest now 41 feet high.

Larix occidentalis is undoubtedly the finest of all larches. Sargent gives its maximum height as 250 feet, and Mr. Elwes mentions a tree in Montana said to have been 233 feet high and 24 feet in girth near the ground. But from personal observation, neither Elwes nor Henry seem to have found trees larger than 180 feet in height with a trunk girthing 15 feet at 5 feet from the ground. It is much to be hoped that so magnificent a tree will succeed generally in the British Isles. The old trees at Kew are planted in some of the driest and sandiest ground on the place; the new plantation, however, is on soil of a more loamy nature. I recently saw in the new Forestry Station founded by the Department of Agriculture in Ireland at Avondale, co. Wicklow, a plantation that had been made of about 1000 trees. Mr. A. C. Forbes was not pleased with their progress; certainly it did not compare with that of common or Japanese larch, but at Avondale the young plantations have to get away from a thick mat of grass, and it is possible that when (or if) they are able to overtop and subdue this, they may show better results.

W. J. B.

Storm on Easter Eve.—A storm of unusual violence passed over Kew and the South of England generally on the evening of Saturday, March 22nd. It commenced suddenly between 7 and 8 p.m. and ceased as abruptly soon after midnight; at its height the wind is said to have attained a velocity of 70 to 80 miles an hour. A few losses have to be recorded. The single specimen Kew possessed of the true pitch pine (*Pinus palustris*) had its top broken off. This tree was about 13 feet high and consisted of one stem about 3 inches thick bearing a few tufts of leaves near the top. It was a mere caricature of what the pitch pine really is, and had to be supported by stakes and wires, but Messrs. Elwes and Henry do not seem to have found a better in the British Isles.

The last tree was also uprooted of the well-known group of very picturesque Weymouth pines (*Pinus Strobus*), which stood in the Rhododendron Dell on the left-hand side of the entrance to the Bamboo Garden. This group of pines, originally four in number, was much beloved of artists; their ivy-clad trunks and gaunt limbs must figure in many hundreds of pictures of various kinds. On this account they were left as long as possible, but one of them was blown down in a storm about three years since and two others had since become so insecure that they were taken down also.

The oldest and largest *Crataegus nigra* in Kew, growing in the Thorn Avenue, was rent in two, and one of the curious circular group of beeches, near the Lily Pond, was snapped off midway up the trunk.

Oil-seeds.—During the past few years there has been considerable activity in the oil crushing industry and many oil-seeds have been submitted to Kew for determination by those interested in the trade. There is a demand for seeds that will yield edible fatty oil with a marc that may be employed as a cattle food.

Samples of the following seeds unfamiliar to the English market as oil-seeds have recently made their appearance, and it may be well in recording the fact to add a few details as to their known properties and applications :—

Lucuma mammosa [*Sapotaceae*] Mammee Sapote. A tree of Tropical America often cultivated in the West Indies for its fruit, which is of a rusty-brown colour, containing an agreeably flavoured pulp, bearing some resemblance to quince marmalade. The seed is polished, with a large scar, and the kernel, which contains hydrocyanic acid, is used in the West Indies for flavouring, as a substitute for bitter almonds.

Vigna Catiang [*Leguminosae*]. The Cow Pea, Chowlee (India), Tow Cok (China). An annual, widely cultivated in the tropical zone for its seeds, which are used as food. The green pods, especially of a long-podded form, are plucked while young and eaten as a vegetable. The stalks and leaves are said to be employed in the preparation of a green dye. A sample of seeds determined as a variety of this species have recently been received from Roumania as "oil-seeds," but according to Church in "Food Grains of India," they contain under two per cent. of oil.

Afzelia quanzensis [*Leguminosae*]. A large forest tree of Tropical Africa. The seeds, which are black with a scarlet aril, are used as charms, for the heads of hat-pins, and for necklaces.

Parkia biglobosa [*Leguminosae*]. Nété, Nitta, or Nutta, African Locust, Café de Soudan. A tree of 40 to 50 feet in height, native of Tropical Africa, with pods 8 to 12 inches long. The seeds are compressed, involved in fleshy, at length dry and mealy pulp, which is used as food, and the parched seeds are employed as coffee in the preparation of a beverage. [See *Kew Bulletin*, Add. Ser. ix., pt. ii., p. 281.]

Pongamia glabra [*Leguminosae*]. A moderate-sized almost evergreen tree of the tidal and beach forests and along tidal river banks all round India, Burma and Ceylon. Also along streams and rivers in the forests of South and Central India extending northwards to the Himalaya and eastwards to the Shan Hills of Burma. Much cultivated. The seeds are reniform, compressed, almost round, smooth and of a grey colour. They are used in native medicine and also yield a thick red-brown oil used for burning, but is not popular for the purpose on account of its offensive odour. It is employed in medicine for outward application in skin diseases, for rheumatism, and to destroy worms in sores.

Semecarpus Anacardium [*Anacardiaceae*]. The Marking Nut tree of India. The fruits consist of an oblong oblique drupe with a thick black pericarp, between the layers of which are the cells containing the corrosive juice which forms the marking ink extensively employed in India to give a black colour to cotton fabrics. The drupe is seated on a yellow astringent hypocarp, which is sometimes eaten, usually either dry or roasted. The kernels contain a small

quantity of sweet oil; the pericarp contains 32 per cent. of a vesicating oil of specific gravity 0·991, easily soluble in ether, and blackening on exposure to the air.

Hydnocarpus venenata [*Bixineae*]. A large tree found by the banks of rivers in Ceylon up to 2000 feet. The seeds are rough, with grooved ridges, and yield an oil of the consistency of ordinary hard salt butter, which is known in Kanara as "Thortay" oil, used in the treatment of skin diseases, leprosy, &c. If eaten, these seeds produce giddiness, and are employed by the natives as a fish poison. Their poisonous properties, however, are so strong that fish, thus killed, are unfit for food. The fruits are also used as a fish poison.

Mesua ferrea [*Guttiferae*]. Ironwood or Nagkesur of Assam, described as a beautiful tree bearing large Cistus-like white flowers, called in Sanskrit "Kanjalkama" and "Nágkesara," and a favourite of the Indian poets. The seeds are of a dark brown colour with a smooth testa, in form and colour resembling chestnuts. The kernels yield 72·9 per cent. of a deep brown or yellow oil, very bitter, which deposits white crystalline fats at ordinary temperatures. In India the oil is employed for burning in lamps, as a healing application to sores, and as an embrocation in the treatment of rheumatism. In Ceylon, where the tree is known as "Na," the oil is used for various diseases in cattle and also against rheumatism. The oil-cake contains 24·16 per cent. of protein.

J. M. H.

Bamboos for Paper-making.*—The four species of Bamboos examined with regard to their suitability for paper-making were *Bambusa arundinacea*, *Bambusa polymorpha*, *Cephalostachyum pergracile* and *Melocanna bambusoides*. The area over which the examination took place was restricted to Lower Burma and the West Coast of the Indian Peninsula as both these localities are geographically well suited for import and export purposes and contain vast areas covered with bamboos. Five areas in Burma and six on the West Coast of India were examined and figures as to yield, etc., were very carefully collected. In order to obtain practical proof of the quality and cost of preparing pulp from bamboos about 80 tons of raw material of the four different species were converted into pulp and eventually into paper at the Tita Shur Paper Mills, Calcutta.

It should be mentioned that the Report is printed on paper made from *Bambusa polymorpha* and that both nodes and internodes were used.

The Report is divided into six parts.

In Part I an interesting historical account of former enquiries as to the value of bamboos for paper-making is given and the general conditions necessary for the successful establishment of a paper-pulp mill are detailed.

Part II deals with the mode of growth and possible out-turn of bamboos. The most useful species appears to be *B. polymorpha*.

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* "Note on the utilization of Bamboo for the Manufacture of Paper-pulp," by R. S. Pearson, I.F.S. The Indian Forest Records, vol. iv, part v. January, 1913. 109 pp. with appendices, maps and photographs.

It is smaller than *B. arundinacea* which is difficult to work with owing to the weight of the culms and the hardness of the nodes. *Cephalostachyum pergracile* is smaller than *B. polymorpha* and not quite so common, but otherwise is considered quite as suitable for paper-pulp. *Melocanna bambusoides* has not so far been found so favourable since a seven years' rotation for cutting has to be allowed for as against a five years' rotation for the other species. Moreover, the paper-pulp made from *M. bambusoides* would not bleach with a reasonable quantity of bleaching powder and black stringy fibres from the sheath also spoilt the quality of the paper. These, however, can easily be removed and it may be found after further testing that a good paper-pulp can be made from this plant. The rate of growth of the different species and the effect of felling is very carefully considered and the cost of extraction and the out-turn for various localities is given in detail.

In Part III the cost of manufacturing the paper-pulp is dealt with and the necessary treatment of the stems is described. Then follow the reports on the pulp made from the four species with figures as to cost.

Part IV (pp. 40–104) occupies the larger portion of the Report and deals in detail with the various bamboo areas in Burma and India and also considers the possible sites for paper-pulp mills. This part is further illustrated by the maps. A great deal of information as to the mode of growth of the bamboos, cost of cutting and extraction, lines of export, labour, etc., is given here, of too special a character for a brief review, but invaluable in connection with the possible establishment of a definite bamboo paper-pulp industry.

In Part V the cost of plant required for a pulp-mill is considered, and in Part VI reference is made to the chemicals necessary for the industry and figures as to their cost, etc., are given.

The Report, which is of an exhaustive nature, affords very valuable data for estimating the probability of the success of establishing a paper-pulp industry in Burma and India.

Prices of English Timber.—Prospective work which is to be carried out by the Metropolitan Water Board on the Littleton Park Estate, Staines, necessitated the disposal of the whole of the timber growing on an area of 600 acres, which was sold by auction on February 12th. The sale was particularly interesting, for it gave a good idea of the average value of the general timber growing in plantations, parks and hedgerows on well-placed estates. The volume of timber ran to approximately 111,000 cubic feet and consisted of oak, ash, elm, horse chestnut, sweet chestnut, plane, Scots pine, larch, spruce, beech, &c., the first three kinds predominating. It may be said to be typical of the timber found on many estates throughout the country, some, more particularly the ash, being of good quality, others being medium, and a fair percentage medium to poor; amongst the latter being aged, rough or immature trees. By a comparison of maximum and minimum prices a good indication is given of the difference in quality of the various lots. The estate is favourably situated for the removal of timber, for it is within

one mile of one railway station, two miles of two others, is near a river wharf and is but 15 miles from London. Moreover, nine months are allowed for the removal of the timber, and facilities are granted for its partial working on the ground. Oak ran to about 54,000 feet and consisted of all classes of trees, from well-grown clean specimens containing between 60 and 110 feet of timber, to rough hedgerow trees of 20 to 40 feet, and a considerable number of small trees containing less than 20 feet each. About 18,639 cubic feet of ash realised the best prices of the sale, and the general quality was more consistent than that of other kinds. Of 24,378 feet of elm offered, a good deal was small and prices generally were low. Horse chestnut was in demand and sold well, and the same may be said of plane. About 1500 feet of beech in several lots created little excitement, and neither lot secured a good price. Larch, spruce and Scots pine together were estimated to yield 4319 feet, and all was knocked down below the average price. In a few cases the trees had been felled, but this fact did not appear to affect the prices to any appreciable extent.

Taking the sale throughout the timber averaged about 11*d.* a cubic foot, omitting fractions, and the prices of individual kinds per cubic foot are given below. In each case small fractions are omitted :—

Variety of Timber.	Average Price.	Maximum Price.	Minimum Price.	Remarks.
Oak	10¾*d.*	1*s.* 11¼*d.*	4¼*d.*	Young and rough trees seriously affected the average price.
Ash	1*s.* 9*d.*	3*s.*	11¾*d.*	Although the maximum price only once exceeded 2*s.* 5*d.*, it only dropped below 1*s.* twice.
Elm	5¾*d.*	10½*d.*	2½*d.*	There was a considerable amount of small timber.
Horse chestnut ...	1*s.* 2¾*d.*	1*s.* 11*d.*	1*s.* 0½*d.*	Appeared to be in good demand.
Plane	1*s.* 1½*d.*	1*s.* 4*d.*	1*s.*	A few buyers were eager to purchase.
Sweet chestnut ...	8*d.*	1*s.* 3½*d.*	7*d.*	—
Beech	7½*d.*	1*s.* 0¾*d.*	4½*d.*	—
Scots pine, spruce and larch	2¾*d.*	9½*d.*	1¾*d.*	The highest price was obtained for one lot composed chiefly of larch.

W. D.

Balanites Dawei, Sprague.

Balanites Maughamii, Sprague.